The Applicant filed an Amendment After Final Rejection on November 30, 2000. The Amendment After Final Rejection was a request to amend the specification, along with claim 9.

An Advisory Action was issued, mailed December 14, 2000. As per the Advisory Action, the Amendment After Final Rejection was *not* entered. The rejection to all pending claims was not removed.

In this Response:

the specification has been amended in the same way as was attempted in the Amendment After final Rejection, but no new matter has been added; and

claims 9 has been amended in the same way as was attempted in the Amendment After final Rejection.

Claims 5-7, 9 are still pending in the present application. Reconsideration is requested. In addition to the above amendments, the Applicant makes the following remarks regarding individual issues:

* The Applicant's time to respond.

The Final Office Action was mailed on 8-31-2000. The Applicant hereby encloses a fee for a 3 month extension [(37 C.F.R. section 1.136(a)(1)]. The deadline for responding therefore ends on the corresponding day of the 6th month thereafter, which is February 28, 2001 (2001 is not a leap year).

In determining whether this document is timely filed, the U.S. Patent Office is asked to note the Applicant's Certificate of Mailing in conjunction with 37 C.F.R. section 1.8. That takes precedence over when the present document is actually received by the U.S. Patent Office.

* The rejection of the claims:

Claims 5-7 and 9 remain rejected under 35 U.S.C. 103(a) as being unpatentable over MacDougall et al. (3,895,966) in view of Admitted Prior Art (APA).

The rejection is respectfully traversed.

First, the rejection does not argue about the merits of all the claims. The burden is on the examiner. No case is made, for example, as to why claim 9 is unpatentable.

Second, regarding independent claim 5, the invention has a feature that is neither taught nor suggested in either one of the prior art references. Novel features are unobvious under 103(a).

The novel feature is:

... an impurity implantation region of impurities of a second conductive-type formed in a first sector of the channel region, the first sector not reaching either one of the source region and the drain region, wherein the channel region exclusive of the first sector has a uniform doping concentration of the first conductive type;

The rejection does not allege either reference as having that feature. In purporting to make a case of non-obviousness of a structural claim, the rejection discusses a usage instead. Such us respectfully traversed, as not meeting the prima facie case of obviousness.

As for only suggesting that feature, the rejection relies on an element 6 of MacDougall. But that, too, is misapplied.

First, the rejection suggests that MacDougall's embodiment is similar to the present invention's in this respect. The rejection tries to pass the burden on to the Applicant for proving that it is not. Such is traversed. The rejection must use what the prior art actually teaches.

Second, MacDougall is directed to precisely controlling the threshold voltage of transistor by lightly implanting impurity ions into a channel region 6 extending from a source region to a drain region. See col. 2, lines 5-29 and col. 2, lines 58-59.

In other words, in MacDougall, dopants are introduced into the whole channel region between the source and drain of the transistor. The introduction of dopants is accomplished by masking all other transistors and exposing the unmasked gate insulator and underlying channel. See col. 2, lines 10-17 and col. 6, lines 2-10.

With the methods suggested or described in MacDougall, the dopants should be introduced into the whole channel region 6. Reference number 6 rather refers to a whole channel region, not just a portion of the channel region, as claimed in the invention. MacDougall's channel is described as extending all the way between the

source and drain regions. If MacDougall had meant to characterize the channel's true shape and extent, he would have used something other than a dotted line.

Instead, the rejection characterizes MacDougall as meaning that doping is in just a portion of the channel region 6, but not in the remainder. The portion is characterized in the Office Action as "a sector". The characterization is respectfully traversed. Nowhere is *a sector* described *in MacDougall.* That is the Applicant's verbiage.

In contrast, in one embodiment of the present invention, to achieve the open drain structure without the p-type impurity-ion-implantation process for opening the channel, the gate 56 is formed to have a little longer length W3 than the conventional length W2 of FIG.2. Thus, the n-type impurity implantation region 54 is formed only at the certain portions of the channel region such that the region "O" becomes a p-channel region where the channel lacks the n-type impurity implantation region 54. See the specification at page 6, lines 24-28. This is nowhere shown or suggested in MacDougall.

The rejection only relies on the fact that the dotted line that delineates element 6 extends along only a portion of the channel. But that is also taken out of context. There is no indication in MacDougall that the dotted line is the range of the first sector in the direction of the channel width. It appears that it merely indicates the existence of the channel region, perhaps its depth, but certainly not its extent in any direction.

Thus, MacDougall does not disclose or suggest a channel region *exclusive* of the first sector having a uniform doping concentration of the *first* conductivity type with the first sector being the *second* conductivity type.

The rejection includes a number of assertions

A first assertion (page 2, section 1, par. 2) is that "introducing dopants into the gate and channel region ... does not mean ... the whole channel region." But such would have to be. Indeed, in the same paragraph it is acknowledged that MacDougall teaches conduction of electrons from the source region to the drain region in the channel region. Conduction would have to be in a continuous region, to form a current path. Any less than the whole channel region would be discontinuous.

More specifically, MacDougall discloses using a metal gate. The fabricating method includes first forming of source and drain, forming of gate oxide, performing of channel ion implantation, and then forming of metal gate. If the channel ion

implantation is performed in a bulk type, then Vt increases instead of decreasing, and if in another type, enhancement or depletion is realized in response to the amount of the ion implantation.

Even if only a part of the channel is ion-implanted in other type than the bulk type and the depletion is realized, MacDougall would not be resulting in lowering the Vt. That is because Vt of the whole Tr is determined as Vt of the enhancement part, unlike with the present invention. That is, the current path is not formed. The Vt in MacDougall is changed in response to the impurity concentration in the channel. For example, in the case of no implantation, the Vt becomes about 7 volts (see column 4, line 41 of the patent to MacDougall). Accordingly, when the channel is partially ion-implanted with a party thereof covered, the Vt increases in a portion of the channel, and then current cannot flow therein, unlike with the present invention.

If, by reading the present invention as a guide with which to treat MacDougall, only a small area in the channel is not ion-implanted, then current might flow if a punch-through phenomenon is implemented. For such to be implemented, however, when the covered channel region is covered with a photo-resist mask, the size of the covered region inevitably varies and the no-implanted area accordingly varies in response to the size, thereby the Vt value cannot be stable or steady. Such is not the purpose, direction or teaching of MacDougall. If anything, the Tr having a punch-through phenomenon therein does not need to be manufactured because of the variance in its characteristics. If a Tr has a punch-through therein, then it is determined as a failure.

Another assertion is that (page 3, section 2, par. 2, line 11), "If dopants were introduced over the whole width of the gate insulator, then some boron implantation would occur in the source/drain regions. McDougall et al. do not disclose further implanting the source/drain regions." This is confusing as to its import. That is because generally, the concentration of source/drain region of a transistor is more than E20 ions/cm^3. In contrast, the concentration of channel region is in the range of several E17 to several E18 ions/cm^3. Thus, the ratio of their concentrations is more than several hundred. MacDougall discloses the dopant concentration of up to 1.4E14 ions/cm^3. On the assumption that the whole dose is doped in the channel region only and the depth thereof is 4500A, then the resulting concentration becomes 3.1E18 ions/cm^3. Even though the concentration in the source/drain region is at least 1.0E20 ions/cm^3, the ion-implantation into the source/drain region does not exert any

influence in its effect. That is, since 100E18 - 3.1E18 = 96.9E18 (that is 9.7E19 ions/cm^3), the concentration becomes lowered a little, junction is maintained, and accordingly further ion-implantation is not needed.

Another assertion is that (page 4, section 3, par. 2), "[T]he threshold voltage can increase if the channel region is exclusive of the first sector". This assertion is one of the Applicant's teachings, yet it is presented as an argument against patentability of the Applicant's inventions.

Importantly, if the ion implantation is performed to form a first sector of the channel region having a *second* conductivity type, and if the channel region *exclusive* of the first sector has a uniform doping concentration of the *first* conductivity type, the threshold voltage cannot be precisely controlled as attempted by MacDougall.

Therefore, MacDougall, when fairly read without the benefit of the Applicant's specification, does not teach or suggest the first sector not reaching either one of the source and drain region and being separated therefrom by equal distances *and* a channel region *exclusive* of the first sector having a uniform doping concentration of the *first* conductivity type with the first sector being of the *second* conductivity type.

Thus, claim 5 is allowable and claims 6-7 and 9, which depend therefrom are also allowable.

CONCLUSION

Applicant respectfully submits that each of the Examiner's rejections have been overcome and that this Application is in condition for allowance, or in improved condition for appeal. Such is respectfully requested.

Respectfully submitted,

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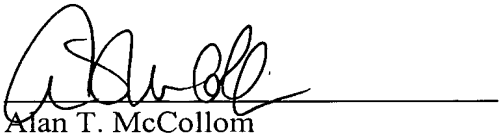

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